



**NORTHROP  
GRUMMAN**

# Weapon System Support Software

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# Our Clients & Business

## Aerospace & Defense Contractor

- Armament Systems
- \$30 billion in revenue / year

## Harlan Mitchell

- Sr. Systems Engineering Manager

## Laurel Enstrom

- Principal Systems Engineer



B-2 Spirit Stealth Bomber  
*Source: Northrop Grumman*



RQ-4 Global Hawk  
*Source: Northrop Grumman*



# The Problem

## Advanced Weapon Systems



Faults with these weapon systems produce a lot of data




NG must dispatch engineers with a tool to collect data



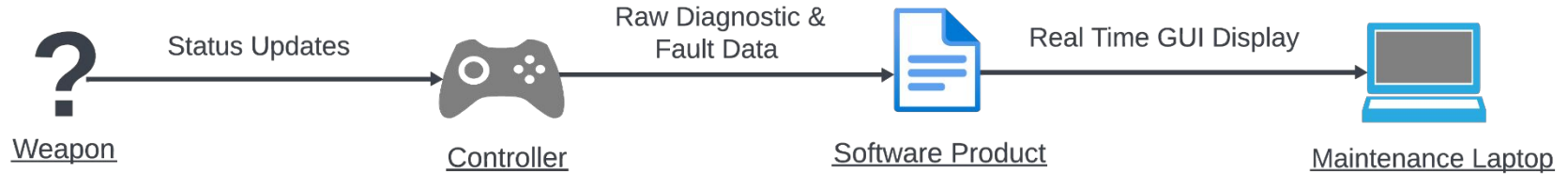
NG will work to resolve the problem, traveling to and from as much as needed

 No end-user diagnostic tool

 Complex, or insignificant data in existing tool

 Expensive to dispatch engineers

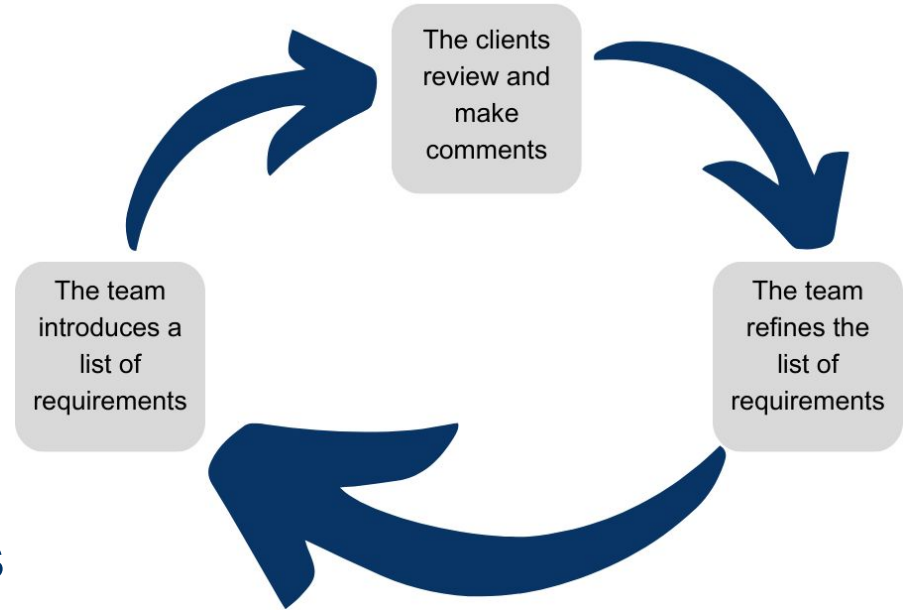
# Solution Overview



- Controller will send data to the software application via RS 422 serial communication
- The application will display the data into GUI and log file if selected by user
- The application will be installed by an installer that does not require administrator rights

# Implementation Overview

- **Key Requirements**
  - Must be a desktop application
  - Read data via RS 422 serial communication
  - Must be able to output to logfile
  - Must be able to filter weapon events and errors



# Implementation Overview

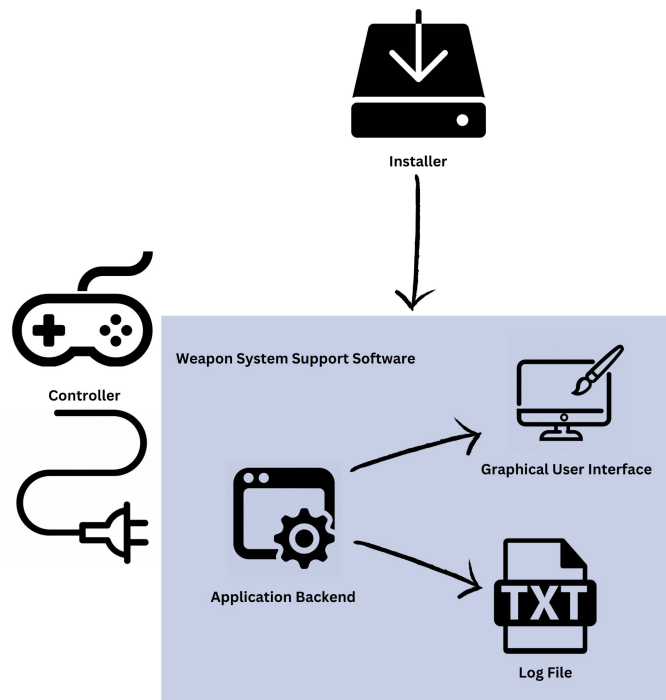
## QT Framework

- QT Serial Bus
- QT Serial Port
- QT Graphical User Interface support



## C++ Backend

- OOP based classes
- Dynamic memory management



# Implementation Details

The image displays four screenshots of the Weapon System Support Software interface, arranged in a 2x2 grid. Each screenshot shows a different view of the application, with the corresponding tab highlighted in the top navigation bar.

- Top-Left Screenshot (Events):** Shows a list of events with details such as ID, timestamp, and message. Summary statistics at the bottom indicate: Total Events: 48, Total Errors: 48, Cleared Errors: 36, and Active Errors: 12. Buttons for 'Open Logfile Folder', 'Set Logfile Folder', and 'Download' are visible.
- Top-Right Screenshot (Status):** Features a central circular gauge with a needle pointing to '90'. The gauge is divided into segments for 'Safe', 'Single', 'Burst', and 'Automatic'. Above the gauge, 'Triggers' are shown as two colored circles (green and red). Summary statistics show 'Total Errors: 58' and 'Total Events: 58'.
- Bottom-Left Screenshot (Electrical):** Displays a table of electrical components and their specifications:

Component	Specifications
Servo Motor	Voltage: 19, Amps: 2
Pump Cooler	Voltage: 2, Amps: 3
Internal Temp Sensor	Voltage: 33, Amps: 4
- Bottom-Right Screenshot (Connection):** Shows 'Connection Settings' for a COM10 port. Parameters include Baud Rate (9600), Stop Bits (1), Flow Control (No Flow Control), Parity (No Parity), and Data Bits (8). Buttons for 'Disconnect', 'Save as Default', and 'Restore Default' are present.

- Each page interacts directly with a back end class.
- Events, Status, and Electrical classes give the user access to weapon information.
- Connection class controls the serial connection.

# Implementation Details Cont.

The screenshot shows the 'Developer' tab of the 'Weapon System Support Software' interface. The interface is dark-themed and contains several sections:

- Developer Tools:** Contains two text boxes for 'Latest message:' and 'Current status:', both displaying the hexadecimal string '5,0,1,0,1,2,90,13,37,31.3496,'. Below these is a button labeled 'Output All Messages Sent From Controller (to qDebug())'.
- Controls:** Features a 'CSIM port' dropdown menu set to 'COM4', a 'Stop CSim' button, and a 'Set to single trigger' button.
- Non-Cleared errors:** Shows a dropdown menu with the text '42, Sample error message 2; 5; 0' and a 'Clear Error' button.
- Send Messages from CSim:** Includes a text input field labeled 'Input message...' and a 'Send message' button.

At the bottom of the window, the status bar displays 'Controller Version: 6.7.2 CRC: 1.2.6' on the left and 'Time Since Last Message: 00:00:00' on the right.

- Developer page is used to control information flow into our program for testing purposes
- It manages the CSIM (Controller Simulator) class which is run within a thread



# Challenges and Resolutions

## Risks

### Misinformation

- Software Miscalculations
- Serial Protocol Encoding/Decoding Errors

### Improper port hardware

- RS422 only

## Challenges

### Completed

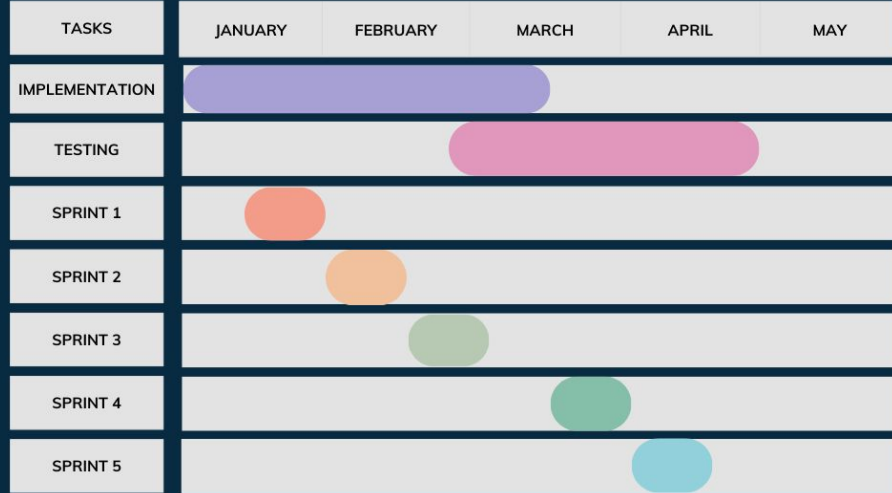
- Feed position
- Simulated Serial Communication
- Installer

### Incomplete

- Testing
- Device to Device serial communication

# Schedule

## TEAM CONTROLLER SEMESTER 2 PLAN



Sprint 3 is done

Current software progress:

- Back-end mostly finished
- Front-end refinement
- Moving on to testing

# Conclusion

Our clients are Northrop Grumman and the main issues are:

- Long travel times
- Complex data
- (Lack of) End user tool

Our goal is to provide our clients with an easy to use desktop application that anyone can use.

We currently meet weekly to showcase what has been accomplished with our clients during our two week sprints